https://doi.org/10.26552/ pas.Z.2022.2.27

UNIVERSITY OF ŽILINA

QUALITY OF SERVICES PROVIDED BY BORYSPIL AIRPORT

Yelyzaveta Turkinevych
Air Transport Department
University of Žilina
Univerzitná 8215/1
010 26 Žilina

Benedik Badánik
Air Transport Department
University of Žilina
Univerzitná 8215/1
010 26 Žilina

Abstract

The aim of the diploma thesis is to develop a proposal for the implementation of the SmartGate system to improve the passport control process in international passenger transport services at the Boryspil Airport. The theoretical part deals with the existing methods of evaluating the quality of airport services and offers an algorithm for airport service quality indicators stigmatization. The analytical part of the work is devoted to the analysis of production and financial activities and competitive advantages of Boryspil Airport. In the project part, modern information technologies of air transport services at the world's leading airports were considered and the efficiency of the SmartGate system implementation at Boryspil Airport was calculated.

Keywords

airport, airport services, quality, methods, SmartGate system.

1. INTRODUCTION

To increase competitiveness in the air transport services market, companies need to pay special attention to quality issues. Although airport service standards have always existed, modern conditions require a change of a specific way of managing airports, focusing on two main objectives: quality and passengers. The high quality of services for all categories of passengers and other means meeting their expectations and at the same time creating an advantage over competitors, which is the key to a long-term partnership with them.

The level of customer satisfaction is affected by the quality of services provided, which leads to market expansion, the emergence of new customers and long-term cooperation with them. The combined effect of the above factors results in quality at the system level, which applies not only to the management system but also to the company as a whole. This allows us to talk about the concept of "airport quality of work", which guarantees an increase in workload, increased profits and a reduction in the airport's economic risks.

Every airport is more or less in a competitive environment. ACI - Airport Council International - identifies the following forms of competition between airports:

- competition to attract new airlines, passengers and cargo;
- competition between airports with overlapping airport catchment areas;
- competition for the role of hubs between airports and for transit traffic flows between hubs;
- competition between airports located in one metropolis;
- competition between airport terminals;
- competition for the right to provide ground handling by airlines.

Awareness of the airport in a competitive environment always leads to the understanding that quality is one of the basic elements in the management system and its measurement is a key element in improving the efficiency of its operation. The aim of the diploma thesis is to develop a proposal for the implementation of the SmartGate system to improve the passport control process in international passenger transport services at Boryspil Airport. (1)

Based on the goal, we can formulate the following goals of this work:

- get acquainted with the methods of evaluation of airport service quality indicators;
- develop an algorithm for evaluating airport service quality indicators;
- analyze the main production and financial results of Boryspil airport and identify shortcomings in the work of the airport operator;
- consider modern information technologies for air transport services at the world's leading airports;
- develop a project proposal to improve the passport control process in international passenger flow at Boryspil Airport.

2. CURRENT METHODS FOR ASSESSING THE QUALITY OF SERVICES PROVIDED BY AIRPORTS

2.1. Methodical approaches to the analysis of the quality of airport services

Creating the conditions for the development of the aviation industry, increasing the quality of transport and the competitiveness of air transport in accordance with the concept of its reform requires research into the quality of airport services. Addressing this issue requires, first and foremost, the evaluation and development of methodological approaches to

airport service quality management, considering their characteristics, identifying the organizational and economic components of airport service quality management, due to both organizational factors that take into account management functions and economic part of the cost of shaping the quality of services.

In the diploma thesis the quality management of airport services are considered as a separate system that provides an optimal ratio of its components. This will create a rational process for managing the quality of airport services and identify a set of factors that affect the quality of services depending on the conditions of their creation and provision.

Quality management of airport services is a set of organizational and economic parameters and indicators that ensure effective quality management of services through modern passenger service organization, ticket records, computer technology for consumer screening and customs control; The result is ensuring the development of technical equipment in the process of providing services, increasing quality, achieving regulation and reducing costs, improving the economic efficiency of implemented measures. (2)

Airport service quality management is a set of interconnected principles, methods, subjective and objective factors and management functions aimed at developing and meeting quality requirements and reducing quality costs. Managing the quality of airport services therefore means ensuring an optimal ratio of their components. At the same time, efforts are being made to achieve priority objectives such as improving quality levels, reducing operating costs and ensuring efficiency.

For the quality process of airport services, it is necessary to determine the organizational and economic parameters and factors that will ensure the correct quality of airport services.

Organizational and economic assurance of airport service quality management is a set of organizational and economic parameters of ensuring the quality of service management through passenger transport organization, ticket registration, passenger screening technology, customs services organization, quality assurance of airport services, organization of customs services, organization of customs offices, quality control of services, management and control of quality of services, ensuring the development of technical equipment of the service provision process, organization of work to improve airport services and regulation and reduction of costs for the quality of airport services.

Ensuring the quality of airport services is implemented through a combination of organizational and economic factors.

2.2. Analysis of airport service quality assessment methods

Growing demand in the air transport market is leading to new requirements for airport service quality management systems. The high level of airport services determines the efficiency of the airport, which is reflected in attracting additional funding by opening new flights, increasing capacity, expanding the list of services provided and attracting new airlines.

Therefore, to function effectively and assess the prospects of future management, they must have information on the level of quality of services, which will identify their strengths and weaknesses, choose the optimal direction of development. It is therefore necessary to assess the level of quality of services provided by the airport. However, there are currently no centralized rules governing the quality of airport services as well as quality control systems for airport infrastructure.

The main elements of the service quality management system are evaluation and quality control. The service quality control system at airports is based on the standards, recommendations, approaches, methods, and techniques of ICAO, ACI, IATA and the independent UK agency Skytrax.

The most important part of a quality management system is its evaluation, which provides information for analysis and allows you to control the quality of services provided and allows management to make the most appropriate management decisions.

Airport market players have faced the problem of the lack of uniform approaches, criteria, and methods for assessing the level of quality of airport services, and thus the need for the independent development of mechanisms for the regulation of service activities. For this reason, it is important to develop common approaches and methods for assessing the quality of airport services, the results of which are needed when planning measures to improve the quality of services provided by airports.

To determine the methods of assessing the quality of airport services, it is important to understand what indicators can be used to assess the level of quality of service at airports. The main indicators of service quality at airports are:

- speed of passenger registration at the checkpoint (passport control on arrival);
- passenger check-in time;
- waiting time in the registration line;
- the time of delivery of the first piece of luggage

Regularity of flights means strict adherence to the flight schedule of scheduled, charter and additional flights, no delays of departures due to airport staff. Regularity of flights is achieved through the main measures:

1) provision of relevant information to passengers:

- flight arrival / departure time;
- flight delay / delay explaining the reasons;
- any changes to flights and passenger services;

2) professional performance of airport staff, namely:

- high level of knowledge, training;
- desire to provide assistance in customer service.
- self-control and politeness in case of disagreements in the dialogue with clients.

3) storage of luggage, cargo and mail handed over for transport.

The level of services at the airport will be ensured by a comprehensive and high-quality provision of services, namely:

- reduction of formalities before and after departure;
- reduction of waiting time for disembarking the aircraft (timely arrival of boarding / exiting stairs and buses);
- minimum waiting time for luggage;
- terminal information security;
- convenience of transferring passengers between terminals;
- convenience of access and availability of parking;
- availability of additional services: post office, banks, cafes, restaurants, Duty Free shops;
- availability of rest rooms and areas for mothers with children;
- internet security of the airport;
- services for passengers with disabilities, etc.

The issue of the quality of services provided at the airport as one of the participants in the air transport process should be addressed by a comprehensive combination of quality of service measures, taking into account the main and complementary quality indicators.

After the analysis of all available sources of information, which consisted of the work of V.V. Kubicheck, A.V. Andreev, Airport Service Quality measurement methodologists, O.Attalik, Seung Chang Lee and others it can therefore be said that there is a lack of sophistication of approaches and methods for assessing the quality of airport services and the need to create a uniform universal system for assessing the quality of airport services. (3) (4)

Within the problem, the work offers a comprehensive algorithm for evaluating the quality of airport services, which includes a professional assessment of the importance of factors affecting the quality of services, as well as the degree of satisfaction with these factors in a particular airline. The choice of an expert method for assessing the level of service quality is due to the impossibility of using methods of objective determination of the values of individual or complex quality indicators by such methods as instrumental, empirical or computational. The key groups of consumers of airport products are airlines that generate revenue from air transport activities, as well as passengers, so the proposed quality of service algorithm will be based on indicators that determine the quality of service for these two groups. The algorithm is based on the development of questionnaires that contain a list of factors that affect the quality of services at the airport. Factors are developed with a classification by groups to identify the main areas for improvement in airport services.

3. ANALYSIS OF OPERATION AND SERVICES PROVIDED BY BORYSPIL AIRPORT

Boryspil International Airport is a Central Asian state-owned trading enterprise under the administration of the Ministry of Infrastructure of Ukraine. 100% of the share capital of the state enterprise Boryspil belongs to the state represented by the Ministry of Infrastructure of Ukraine. Management is performed by the CEO in the person of Pavel Riabikin. The main tasks of the state enterprise "Boryspil" are:

- timely satisfaction of economic demand and social needs in the provision of air transport services;
- ensuring aviation and flight safety.

Boryspil International Airport is the subject of natural monopolies in terms of ensuring the landing and take-off of aircraft, ensuring aviation safety, ensuring excessive parking of aircraft, providing services at the airport.

Boryspil Airport is the only airport in Ukraine that successfully competes with major European airports. According to the International Airports Council (ACI EUROPE), Boryspil led a growth rating among major airports in Europe in 2018 (first in the group of European airports serving 10 to 25 million passengers). According to the results for 2018, the credit rating of Boryspil International Airport reached the maximum level of uaAAA, the forecast is "stable". The company with a rating of uaAAA has the highest credit rating compared to other Ukrainian companies or debt instruments. The airport is a member of relevant international and national associations: the International Airport Council of the European Region, the Ukrainian Air Transport Association (UATA), the Chamber of Commerce and Industry of Ukraine, the Ukrainian Quality Association, the Employers 'Transport Services Employers' Association, the Association of Taxpayers of Ukraine, etc., and is governed by the standards and procedures of the International Air Transport Association (IATA) and the International Civil Aviation Organization (ICAO). Boryspil Airport is the only airport in Ukraine from which scheduled intercontinental flights operate.

Because of an active policy of attracting airlines, the airport operates more than 40 national and foreign airlines, including: Air Arabia, Air Astana, Air Baltic, Air France, Air Malta, Air Moldova, Adria Airways, Atlasjet Ukraine, Azerbaijan Airlines, Azur Air, Austrian Airlines , Belavia, British Airways, Bravo Airways, Brussels Airlines, Bukovyna, Czech Airlines, Ellinair, Flydubai, Georgian Airways, Iraqi Airways, KLM, LOT, Lufthansa, Myway Airlines, Qatar Airways, Ryanair, SkyUp, SWISS, Turkish Airlines, Ukraine International Airlines, Wind Rose, YanAir, etc. (5)

Demand for airport services is supported by the advantageous location at the intersection of several interstate transport routes (connecting Asia with Europe and America), the proximity of the capital, the availability of modern infrastructure and the implementation of a mushroom development strategy.

The airport infrastructure includes two runways (4 km and 3.5 km long), which allow the reception of aircraft of any type, without limiting weather and light conditions, as well as 2 terminals (D and F). The second runway 18R/36L is currently in limited mode on the sides of terminal F.

Boryspil Airport is constantly striving to improve - developing infrastructure, attracting new airlines, and improving service quality. In 2019, the Cabinet of Ministers of Ukraine approved the Concept for the Development of Boryspil International Airport for the period up to 2045, the main priorities of which are the development of infrastructure and the introduction of modern services.

Boryspil has its core business in three segments: air services, auxiliary air services and commercial services.

Boryspil Airport is the only one in Ukraine with regular transcontinental flights. In line with the airport's "hub" development strategy, implemented since 2015, all international and domestic flights have been relocated to Terminal D, which reduces passenger handling time and significantly reduces the airport's costs for maintaining terminals B and F, which have been temporarily suspended. Exhibitions, presentations, and other events were held regularly in Terminal F, the proceeds of which covered the costs of its maintenance. In 2018, Terminal F was preparing to resume operations as an air passenger terminal from March 2019 due to a significant increase in passenger traffic attracted by the airport. In addition to passenger terminals, there is also a freight terminal.

For a more convenient transfer to the airport was launched in November 2018 Kyiv Boryspil Express - it is a specialized express connecting the main railway station in Kiev with the state enterprise "Boryspil".

The SARS-CoV coronavirus pandemic in 2019 began in December 2019 in Wuhan, Hubei, China. As of March 20, 2022, 470 million people worldwide were ill.

The COVID-19 pandemic also hit the air force hard - since February 2020, and especially in the spring, airlines have significantly reduced the number of flights or suspended flights altogether. As a result of the government's decisions on quarantine, closure and banning or restricting entry, the pandemic crisis in aviation has been the deepest since World War II. In April 2020, the number of flights (compared to April 2019) in the world decreased by 80% and in Europe by 90%.

In the spring of 2020, a complete lockdown was introduced to stop the COVID-19 coronavirus infection. During this period, scheduled flights to Ukraine and abroad were suspended, so the management of the airline UIA based at Boryspil Airport introduced an anti-crisis program to restructure costs, optimize staff and minimize airline costs.

On December 31, 2021, Boryspil International Airport opened its gates to all visitors after a period of restrictions imposed because of the proliferation of COVID-19.

On the morning of February 24, 2022, Russia launched a large-scale war against Ukraine. Missile attacks were launched on several military facilities in Kyiv, Kharkov and Dnipro. Boryspil Airport is said to resume its usual activities as soon as possible after a war.

3.1. Analysis of the production and financial performance of Boryspil Airport

It should be noted that since 2016, the passenger air transport market has been developing relatively dynamically. The number of passengers who have used the services of Ukrainian Airlines has grown by an average of a quarter each year.

Commercial flights of domestic and foreign airlines were served by 20 Ukrainian airports, during the period under review the total number of aircraft departing and arriving reached 182.8 thousand, which is 14.3% more than in 2017. At the same time passenger transport through Ukrainian airports, which crossed the border 20 million, reached 20,545.4 thousand people, which ensured growth of 24.5%. Freight transport increased by 7.8% to 56.4 thousand. tons.

According to statistics for 2018, there was a significant increase in the number of passengers handled at all major airports: Kyiv (Zhulyany) (by 51.9%), Lviv (by 47.9%), Boryspil (by 19.4%), Kharkiv (by 19.3%), Odesa (by 17.8%) Zaporizhzhia (by 14.9%) and Dnipro (by 8.1%). A significant increase in passenger traffic was also recorded at Chernivtsi (by 53%) and Kherson (by 41.8%) airports. (1)

It should be noted that today almost 98% of total passenger traffic and 99% of postal traffic is concentrated at 7 airports in the country - "Boryspil", "Kyiv (Zhulyany)", "Lviv", "Odesa", "Kharkiv", " Zaporizhzhia "And" Dnipro ".

Boryspil Airport is the first state-owned enterprise to make an effective transformation of its business model and in a few years has transformed itself from a stagnant and unprofitable to a highly efficient and highly profitable European leader in terms of growth.

The strategy of building the so-called collection airport (type "hub"), implemented since 2015, is aimed at attracting additional transfer passengers from foreign markets.

At present, the share of transfer passengers reaches almost 30% of the total passenger traffic at Boryspil Airport. Attracting a significant number of additional transfer passengers reduces the cost of serving a single passenger, thus reducing the cost of airport services and making them more attractive to airlines and passengers.

Boryspil Airport, together with the airlines based in it, thus create an aviation product that is attractive on the Ukrainian and international markets. This strategy has ensured a significant increase in the number of passengers attracted to the airport.

Boryspil International Airport handled 9.433 million passengers in 2021 (of which 8.798 million regular passengers, 635.2 thousand non-scheduled passengers), bringing passenger traffic back to 62% of the 2019 level.

According to the website, the airport recorded 75.8 thousand movements in 2021 (of which 64.5 thousand international and 11.3 thousand national), which is 68.5% from 2019.

According to a report by the International Airports Association (ACI Europe), Boryspil led a growth rating in 2021 among major European airports. The airport Boryspil occupied the fourth place in the group of European airports handling 10 to 25 million passengers.

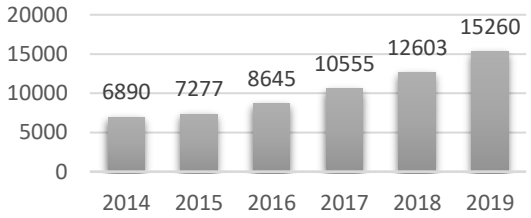

Figure 1. Dynamics of the number of passengers handled at Boryspil Airport during the years 2014-2019. Source: Author's

Stable growth of passenger transport is ensured not only by cooperation with the largest carrier of Boryspil Airport, Ukraine International Airlines (UIA), but also by acquiring new carriers. During 2018, the airport welcomed 10 new airlines. Collaborated with Ryanair, Brussels Airlines, Iraqi Airways, Myway Airlines, Ellinair, Air Malta and Sky Up, renewed its partnership with SWISS, FlyDubai, Air Moldova. The growth of all categories of passengers was ensured, the largest increase was in the category of transfer passengers. In total, more than 50 powerful international airlines fly to the airport. Airlines and passengers at Boryspil Airport are mainly attracted by:

- competitive costs of the company's services provided by transparent "Regulations on the application of reduction factors to airport charges";
- wide geography of Boryspil airport routes;
- according to ACI Europe 2018, the airport is one of the 30 best airports in Europe for the quality of transfer flights;
- high quality of the company's services.

The main part of Boryspil International Airport's revenues (about 59%) consists of revenues from airport fees (passenger fee, aircraft take-off and landing fee, aviation security fee, parking fee). Airport charges are regulated by government agencies, which reduces the flexibility of the airport's pricing policy. (6)

Revenues from airport charges grew at a slower pace than other revenue items in 2018 due to a reduction in the passenger tax rate under the Ministry of Transport and Infrastructure Regulation and the extension of incentives (discounts) to airport charges by 80% for all carriers as recommended by the Antimonopoly Committee of Ukraine.

Other revenue segments of the airport show a very high positive dynamics, mainly due to increased passenger traffic due to reduced profitability of airport charges. Boryspil Airport thus provides an effective profitability management policy that ensures an increase in financial results (revenues and profits) and an increase in passenger transport (satisfaction of social needs and economic demand in the development of air transport).

By summarizing the activities of Boryspil International Enterprise in 2019, we observe stable growth of key indicators.

3.2. Analysis of the current state of activities of Boryspil Airport

Boryspil Airport successfully competes with the leading airports in Europe, so it must meet the latest international criteria and quality standards. To explore and implement best practices and innovations, relevant airport specialists participate in industry exhibitions and conferences, study the latest ICAO and IATA recommendations, and actively participate in the preparation of relevant amendments to national regulations to improve standards and international standards.

Research and implementation of innovations at the airport is taking place in all major areas. According to the results of the research in the years 2017-2018, several innovative technologies were put into operation, which enabled:

- an increase in the capacity of security checkpoints by 40% without increasing the number of staff;
- reorganization of the aircraft parking system on the apron and increase of the number of taxiways;
- shortening the time of inter-flight check-in of passengers, passengers and luggage and increasing the use of parking spaces for aircraft;
- shortening the runway cleaning time in severe weather conditions by 30% and increasing the number of flights served due to the introduction of new high-performance snow removal equipment;
- increasing the number of self-service kiosks for passengers and luggage;
- speeding up the passenger check-in process via Fast Lanes;
- renewal of rescue equipment, which ensured the implementation of recommended international standards and created the possibility of operating modern wide-body aircraft, which are used to develop promising long-distance routes.

Research on best practices and implementation of innovative sectoral and inter-functional solutions at Boryspil Airport is aimed primarily at increasing runway, terminal and transfer zone capacity, reducing passenger and baggage handling times, reducing flight time and number, reducing wage and financial costs per flight. and passenger services. As a result, Boryspil Airport increases labor productivity and reduces unit costs every year.

Boryspil operates in Ukraine, where the political and economic situation in the country in 2018 was largely determined by factors that emerged in 2014-2015. It was characterized by instability, which led to a deterioration of public finances, volatility of financial markets, illiquidity of capital markets, instability of the national currency against major foreign currencies. These factors negatively affect the socio-political, financial and market risks that affect the company's operations.

Boryspil International Airport also operates in the context of sectoral (technical and operational) risks, environmental risks and other risks (cyber threats, public nuisance, terrorism, etc.).

Boryspil Airport identifies and manages risks to ensure its continuity and fulfill its statutory tasks (profit from economic activity, timely satisfaction of economic demand and public needs in the provision of air transport services, safety).

Most of the identified risks are provided with a qualitative assessment based on an expert analysis of the probability of their occurrence and their impact on the company. For each identified risk, a formalized or informal policy will be developed to reduce the potential negative effect. The main provisions of some risk management principles are disclosed (for example, financial risk management policy - in the financial statements together with the independent auditor's report, environmental risk management - in relevant reports, etc.), but some policies (operational, cyber threat prevention, public order prevention, fight against terrorism, etc.) cannot be published.

However, Boryspil Airport systematically publishes the results of the risk management system - production, business, financial, environmental, social, flight safety reports and more. The results confirm that the airport takes all measures necessary to maintain the stable operation and development of the company.

Decree of the President of Ukraine of 04.09.2015 №535 / 2015 "On the decision of the National Security and Defense Council of Ukraine of 20.07.2015" on measures to protect the national interests of Ukraine in the field of aviation "provides for the establishment of an international hub airport (hereinafter" hub "). Pursuant to that decision, the Austrian company Airport Consulting Vienna GmbH has drawn up an updated Boryspil Airport Development Concept. The document was approved by all interested central executive bodies and sent for approval to the Cabinet of Ministers of Ukraine.

The purpose of the concept is:

- ensuring the sustainable development of the airport as an international hub;
- increasing the level of flight safety and aviation security;
- increasing the level of passenger services;
- creating a favorable investment climate for the development of airport infrastructure, including minimizing the use of public funds;
- overcoming growing competition from European airports.

The implementation of the Concept is planned for the period up to 2045 and consists of seven main stages, each of which is determined by the volume of projected air traffic. In implementing the measures defined by the Concept, Boryspil Airport can provide the following traffic volumes: in 2019 - 14.4 million passengers, in 2030 - 28 million, in 2040 - 44 million, in 2045 - about 54 million passengers.

In order to determine the detailed tasks and measures necessary for the implementation of the first stage of the concept Ministry of Infrastructure of Ukraine no. 289 of 28.07.2015 approved the Strategic Development Plan of the state enterprise SE "Boryspil" for the period 2015. -2019. By Regulation of the Ministry of Infrastructure of Ukraine no. 500 of October 29, 2018, the plan changed. The strategic plan corresponds to the "National Transport Strategy of Ukraine until 2030". (6)

According to the Strategic Plan, the factors that will ensure the high competitiveness of the airport in the coming years are:

- the presence of a strong base airline operating on a "hub & spoke" model;
- the availability of a transparent and flexible system of incentives for air carriers, aimed at increasing passenger transport (direct and transfer) and developing a network of routes;
- development of non-aviation activities;
- development of airport infrastructure (terminals, platforms, runways, service systems, etc.) for the provision of comfortable services to passengers and air carriers in conditions of dynamically growing demand and development of the network of routes.

World experience shows that any airport can only become a "hub" through cooperation with basic airlines, which have an extensive network of routes. The synergy between airlines and airports creates a common product that is competitive in terms of "price and quality". Fulfillment of the Development Concept and the Strategic Plan will ensure stable growth of the airport's revenues and the profitability of its activities in the conditions of cheaper air transport.

4. PROPOSAL AND RECOMMENDATIONS FOR IMPROVING BORYSPIL AIRPORT SERVICES

4.1. Research of modern passenger check-in technologies at the airport

Over the last 10 years, the process of passenger transport at the airport has changed dramatically as a result of the introduction of biometric control systems as well as mobile check-in and baggage tracking services. According to SITA forecasts, the development is expected to accelerate in the next 10 years. With the advent of digital transformation in the aviation industry, passengers will discover the endless possibilities of advanced technologies - from taxi flights to airports with their own intelligent system. SITA claims that major changes will affect almost all airport systems.

In a modern world there are many passport control systems. The most common among them are:

- BorderXpress Kiosks
- Global Entry
- Automated Passport Control (APC)

However, the disadvantage of these systems is that passengers must enter data about themselves, but the most effective technology today is the automated passport control system "SmartGate", because this system does not require any additional data.

SmartGate (eGate in New Zealand) is an automated self-service border control system operated by the Australian Border Forces and the New Zealand Customs Service and is located at immigration checkpoints in departure and arrival halls at ten Australian international airports and 4 international airports such as New Zealand. SmartGate enables Australian ePassport holders and ePassport holders from many other countries to go through immigration control more quickly and increase travel security by conducting passport checks electronically. The SmartGate system uses face recognition technology to verify the identity of the passenger against the data stored in the chip in his biometric passport. (7)

With the number of passengers around the borders with Australia and New Zealand continuing to grow, SmartGate systems provide a viable means of coping with this increased burden. The system provides passengers with a more convenient and faster way to get through customs at the airport. (8)

Increased security is also a key feature of the SmartGate system. The use of SmartGate biometric gateways helps ensure that those who should not be in the country and those who should not leave the country do not enter the country, and also helps to limit the use of stolen passports as a means of identity theft.

According to Janet Tyson, of the Australian and New Zealand School of Government, all passengers at Australian airports have benefited from faster handling with SmartGate - on average it took 16 minutes from arrival to customs compared to more than 20 minutes for passengers outside SmartGate who they also benefited from shorter queues. (9)

The SmartGate system was chosen for this diploma thesis, as the airports of New Zealand or Australia are easily compared to the Ukrainian airport Boryspil in terms of the number of handled passengers. Given the work of David K. Kneale from Australia, who conducted research and surveys on passenger satisfaction with SmartGate, we can state that SmartGate could be installed at a Ukrainian airport, as more than 70% of passengers of different ages are satisfied with it. (10)

4.2. Development of project proposals to improve passport control at Boryspil airport

The SmartGate system is automated and allows you to shorten the time when passing passport control, then considering all the results can be calculated how much time in the queue is reduced when using this system.

When using the "SmartGate" system, the passage of the passport control of one passenger takes 18 seconds [17], while in the normal passage of the passport control, this time is 5 minutes. This result can be grounded by taking the average value of a passenger standing in line for a passport control. Naturally, the one who is first in line will pass passport control much faster than the one at the end of the line itself.

Due to the formula for the average request time during service, we will make changes in connection with the introduction of an automated passport control desk.

The task of the Queueing theory is to create recommendations for the rational construction of transmission systems, rational organization of their work and regulation of the flow of requirements in order to ensure high efficiency of service with minimal costs for system design and operation.

The method of the Queueing theory provides the best option for passenger transport, where service time will be minimal and quality - high, without additional costs.

The Queueing theory makes it possible to obtain more accurate calculations to improve the passage of passport control. (11)

Based on the results obtained, it can be stated that the time that passengers spend in a row will be significantly reduced, which has a positive effect on the quality of airport formalities in general.

The Queueing theory thus reaffirms the need to implement the automated passport control system "SmartGate".

4.3. Economic efficiency of SmartGate system implementation at Boryspil airport

Boryspil Airport will be able to automate the processing of passenger data through the installation of "SmartGate" electronic turnstiles based on face recognition. Such turnstiles can be installed in departure and arrival halls in self-service mode without the participation of border guards.

The technical result is an increase in the reliability of the identity verification system by implementing exercises of automatic control of biometric characteristics and documentary data of an individual.

The technical result is achieved by the fact that the system contains the following blocks:

- reception of visual passport scanning data;
- identification of reference addresses of the database of endangered citizens;
- data selection;
- creation of addresses of the database of endangered citizens;
- identification of data of vulnerable citizens;
- receiving data from the database of vulnerable citizens;
- receiving data from the electronic passport integrated circuit;
- identification of visual reading data;
- identification of biological personality parameters;
- receiving fingerprint data;
- task type data records;
- selection of data record types;
- selection of reference addresses of data record types;
- editing of addresses for recording and reading data;
- integration of data recording and reading signals.

Using this system will be useful to save space at the airport. Thanks to the SmartGate system, passenger service time is reduced compared to standard passenger passport control, which improves passenger service and at the same time saves not only time during rush hour, but also money.

4.4. Investment calculation

In the case of the implementation of SmartGate, Boryspil Airport will return the invested money in about 3 years, which is not a bad result in terms of time.

Installing the system will reduce international travel time by an average of 80%, as SmartGate will allow them to scan documents in person without having to spend time completing declarations, such as in other widely used existing systems.

Due to the introduction of the SmartGate system at the Ukrainian airport, it will be possible to save considerable funds

from the cost indicators calculated by us, which will allow the airport to direct the saved money to the airport modernization, as originally planned by the Ukrainian modernization program.

As the issuance of biometric passports is gaining popularity today, it is possible to introduce an automated passport control system i.e., to use this system with the participation of a passport control worker. In this case, only holders of biometric passports will be able to pass the automated check. Other passports will be checked manually. Passport control services can also selectively check the passports of those using the automated system until the system is implemented and biometric passports are owned by all those who use air transport. The competent authorities of Boryspil Airport must also consider aviation security measures, border integrity measures, anti-drug measures and immigration controls when implementing SmartGate.

5. CONCLUSION

The work analyzes the main methods of evaluating the quality of airport services. As a result of the study and analysis of a large number of scientific publications, as well as an assessment of the situation in the airport services market, the document presents an algorithm for assessing the quality of airport services that facilitates monitoring of problem areas and making the right management decisions in this area. In addition, this algorithm can be applied to any company that provides airport services, regardless of the scope of activity, legal form of ownership or geographical location.

The analytical part of the thesis analyzed Boryspil Airport, its history and structure; geography of transport; main characteristics of terminals; information systems and technologies implemented at the airport; main production and financial indicators of the airport. Next, an analysis of the airport's revenue and expenditure structure is performed; business competitiveness; the main carriers operating flights to the airport are listed.

The project part of the work dealt with information systems and technologies implemented at the most modern airports in the world and the benefits of implementing SmartGate at Boryspil Airport.

The main purpose of introducing innovative technologies is to improve the quality of passenger services and increase the efficiency of airports and airlines.

Given the positive trends in the demand for air services around the world, the need to improve passenger services and thus streamline operations, the priority of foreign airport management is to optimize the use of available resources and effectively manage passenger flows using the concept of "smart airport".

One of the main stages that ensures the safety of the airport, and its flights is the completion of airport formalities.

The introduction of innovative passenger transport equipment at Boryspil Airport is not only cost-effective but will also help to improve passenger passport control services.The result of the diploma thesis is that by introducing the SmartGate system, Boryspil Airport can save money by reducing the number of employees and return the investment in about 3 years.

REFERENCES

[1] Malinoshevska, K. I. Quality management services at airports. [Online] 2015. [Cited: April 20, 2022.] https://www.econa.org.ua/index.php/econa/article/download/740/549.

[2] Sydorenko, K.V. Dissertation work. Forming the competitiveness of the production infrastructure of international airports. Oles Honchar National University in Dnipro. [Online] 2018. [Cited: April 25, 2022.] https://www.dnu.dp.ua/docs/ndc/dissertations/D08.051.03/dissertation_5bc88f1046198.pdf.

[3] Andreev, A.V. Methodological basis for creating indicators of airport competitiveness estimation. s.l. : Scientific Herald MSTU GA, 2012. pp. 13–19.

[4] Kubicheck, V. V. QUALITY RATING OF SERVICES OF AIRPORT INFRASTRUCTURE. [Online] 2011. [Cited: April 02, 2022.] https://pnu.edu.ru/media/ejournal/articles/2012/TGU_2_18.pdf.

[5] Official website Boryspil International Airport. Boryspil International Airport. [Online] April 10, 2022. [Cited: April 02, 2022.] https://kbp.aero/en/.

[6] Boryspil International Airport State Enterprise Management Report. [Online] February 02, 2020. [Cited: April 18, 2022.] https://kbp.aero/wp-content/uploads/2020/08/Zvit-pro-upravlinnya-DPMA-Boryspil-za-2019-rik.pdf.

[7] Trader, John. Biometric SmartGates Improve Border Security and Airport Efficiency. M2SYS Blog On Biometric Technology. [Online] Oktober 08, 2014. [Cited: April 23, 2022.] https://www.m2sys.com/blog/guest-blog-posts/biometric-smartgates-improve-border-security-airport-efficiency/.

[8] SMARTGATES. [Online] Australian Border Force. [Cited: April 19, 2022.] https://www.abf.gov.au/entering-and-leaving-australia/smartgates/arrivals.

[9] Tyson, Janet. Arriving at SmartGate: the automated passenger processing project. [Online] 2014. [Cited: April 18, 2022.] https://www.anzsog.edu.au/preview-documents/case-study-level-3/943-arriving-at-smartgate-the-automated-passenger-processing-project-b-2014-163-2/file.

[10] Kneale, David K., Baxter, Glenn S. and Wild, Graham. THE USE OF E-PASSPORTS FOR INBOUND AIRPORT BORDER SECURITY SCREENING: THE PASSENGER PERSPECTIVE. [Online] October 10, 2014. [Cited: April 11, 2022.] https://journals.vilniustech.lt/index.php/Aviation/article/view/2930/2408.

[11] KAZDA, A., CAVES, R.E. 2007. Airport Design and Operation. Bingley: Emerald Group Publishing Limited, 2007. 538 s. ISBN 978-0-08-045104-6.

[12] NOVÁK, A., MATAS, M. Models of processes as components of air passenger flow model. Communications-Scientific letters of the University of Zilina 10 (2), 50-54